IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

INTELLECTUAL VENTURES II LLC, Plaintiff, v. T-MOBILE USA, INC., T-MOBILE US, INC., ERICSSON INC., and TELEFONAKTIEBOLAGET LM ERICSSON Defendants.	Civil Case No.: 2:17-cv-661 **JURY TRIAL DEMANDED**

COMPLAINT

Plaintiff Intellectual Ventures II LLC for its Complaint against defendants T-Mobile USA, Inc., T-Mobile US, Inc., Ericsson Inc., and Telefonaktiebolaget LM Ericsson hereby alleges as follows:

THE PARTIES

1. Intellectual Ventures II LLC ("IV") is a Delaware limited liability company with its principal place of business at 3150 139th Ave SE, Bellevue, Washington 98006.

2. T-Mobile USA, Inc. ("T-Mobile USA") is a Delaware corporation with its principal place of business at 12920 SE 38th Street, Bellevue, Washington 98006.

3. T-Mobile US, Inc. ("T-Mobile US") is a Delaware corporation with its principal place of business at 12920 SE 38th Street, Bellevue, Washington 98006. T-Mobile US is the parent corporation of T-Mobile USA and was formerly known as MetroPCS Communications,

Inc. ("MetroPCS"). Following an April 2013 business combination between T-Mobile USA and MetroPCS, MetroPCS was renamed T-Mobile US, Inc.

4. T-Mobile USA and T-Mobile US will be referred to collectively as "T-Mobile" or "the T-Mobile Defendants." The T-Mobile Defendants operate one or more wireless telecommunications networks to provide wireless telecommunications services under brand names including but not limited to "T-Mobile" and "MetroPCS."

5. Ericsson Inc. ("Ericsson") is a Delaware corporation with its principal place of business at 6300 Legacy Drive, Plano, Texas 75024.

6. Telefonaktiebolaget LM Ericsson ("LM Ericsson"), the parent corporation of Ericsson, is a company organized under the laws of Sweden with its principal place of business at Torshamsgatan 23, Kista, 164 83 Stockholm, Sweden. Ericsson and LM Ericsson will be referred to collectively as "the Ericsson Defendants."

NATURE OF ACTION

7. This is a civil action for infringement of U.S. Patent Nos. 8,682,357, 8,897,828, 8,953,641, 9,320,018, 9,532,330, and 9,681,466 ("Patents-in-Suit") arising under the patent laws of the United States, 35 U.S.C. § 1 *et seq.*

JURISDICTION AND VENUE

8. This Court has subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a) because it arises under the patent laws of the United States.

9. This Court has personal jurisdiction over the T-Mobile Defendants, both of which have committed acts of infringement in this judicial district in violation of 35 U.S.C. § 271. In particular, they have performed infringing methods and made and used infringing systems for

providing wireless telecommunications services. The T-Mobile Defendants derive substantial revenue from the sale and use of infringing products and services in this district.

10. The T-Mobile Defendants maintain a significant physical presence in this judicial district. T-Mobile US maintains a corporate office at 2250 Lakeside Boulevard, Richardson, Texas, and T-Mobile USA maintains a Network Operations Center at 7668 Warren Parkway, Frisco, Texas, both of which are located within this judicial district. There are numerous T-Mobile and MetroPCS retail stores within this judicial district, including in each of Allen, Kilgore, Longview, Plano, Sulphur Springs, and Tyler, Texas. The purpose of these stores is to sell user devices, including cell phones, and telecommunications services to be provided by the T-Mobile Defendants.

11. This Court has personal jurisdiction over the Ericsson Defendants, both of which, upon information and belief, have committed acts of infringement in this judicial district in violation of 35 U.S.C. § 271. The Ericsson Defendants derive substantial revenue from the sale of infringing services and products distributed within this district and expect or should reasonably expect their actions to have consequences within this district.

12. The Ericsson Defendants maintain a significant physical presence in this judicial district. Ericsson's headquarters is located at 6300 Legacy Drive, Plano, Texas 75024, which is within this judicial district. Ericsson is wholly-owned and controlled by LM Ericsson and acts as the agent for LM Ericsson in making sales, servicing equipment, and otherwise carrying out the operations of LM Ericsson in North America. LM Ericsson and/or its affiliates manufacture wireless telecommunications equipment and then arrange with Ericsson to import those products into the United States for installation in the T-Mobile Defendants' network. Upon information and belief, representatives of LM Ericsson regularly visit this district in their supervisory

capacity over Ericsson. At all times relevant hereto, Ericsson was acting as the agent of LM Ericsson.

13. Joinder of the T-Mobile and Ericsson Defendants in this action is proper under 35 U.S.C. § 299(a). IV's right to relief against the T-Mobile and Ericsson Defendants for their infringement of the Patents-in-Suit arises out of the same series of transactions or occurrences, namely their cooperation in planning, developing, testing, operating, and maintaining the T-Mobile Defendants' Long Term Evolution ("LTE") network. No claim is made in this complaint against the Ericsson Defendants in relation to products or services sold to other wireless carriers.

14. Venue is proper in this judicial district. All of the relevant defendants reside in this judicial district within the meaning of 28 U.S.C. § 1400(b). The T-Mobile Defendants and Ericsson Inc. have committed acts of infringement within this district and have regular and established places of business here. LM Ericsson is a foreign corporation, and pursuant to 28 U.S.C. § 1391(c)(3), may be sued in any judicial district. The residency of LM Ericsson is disregarded under § 1391(c)(3) when determining where the action may be brought.

THE PATENTS-IN-SUIT

15. On March 25, 2014, the United States Patent and Trademark Office ("PTO") issued United States Patent Number 8,682,357 ("`357 Patent"), entitled "Paging in a wireless network." IV is the assignee and owner of the right, title, and interest in and to the `357 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

16. On November 25, 2014, the PTO issued United States Patent Number 8,897,828 ("`828 Patent"), entitled "Power control in a wireless communication system." IV is the assignee

and owner of the right, title, and interest in and to the `828 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

17. On February 10, 2015, the PTO issued United States Patent Number 8,953,641 ("`641 Patent"), entitled "Methods and apparatus for multi-carrier communications with variable channel bandwidth." IV is the assignee and owner of the right, title, and interest in and to the `641 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

18. The parent of the `641 Patent, United States Patent Number 7,787,431 ("`431 Patent"), was challenged by the Ericsson Defendants in two *inter partes* reviews, IPR2014-01195 and IPR2015-01664. In two final written decisions, 10 of the 12 claims tried were found not unpatentable.

19. On April 19, 2016, the PTO issued United States Patent Number 9,320,018 ("`018 Patent"), entitled "Scheduling data transmissions in a wireless network." IV is the assignee and owner of the right, title, and interest in and to the `018 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

20. On December 27, 2016, the PTO issued United States Patent Number 9,532,330 ("`330 Patent"), entitled "Paging in a wireless network." IV is the assignee and owner of the right, title, and interest in and to the `330 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

21. On June 13, 2017, the PTO issued United States Patent Number 9,681,466 ("`466 Patent"), entitled "Scheduling transmissions on channels in a wireless network." IV is the assignee and owner of the right, title, and interest in and to the `466 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

FACTUAL BACKGROUND

Intellectual Ventures

22. Intellectual Ventures Management, LLC ("Intellectual Ventures") was founded in 2000. Since its founding, Intellectual Ventures has been deeply involved in the business of invention. Intellectual Ventures creates inventions and files patent applications for those inventions; it collaborates with others to develop and patent inventions; and it acquires and licenses patents from individual inventors, universities, and other institutions. A significant aspect of Intellectual Ventures' business is managing the plaintiff Intellectual Ventures II LLC. Intellectual Ventures has paid more than half a billion dollars to inventors and has generated more than $3 billion dollars through the licensing of intellectual property.

23. Intellectual Ventures conducts research in, among other areas, photonics, nanotechnology, electronics, environmental testing, metallurgical analysis, new satellite antennas built on electromagnetic metamaterials technology, and next-generation nuclear power technologies. These technologies are being commercialized by venture-backed start-up companies and, in 2017 alone, start-up companies incubated at Intellectual Ventures and based on technologies invented there have raised more than $100 million dollars in venture funding.

24. In addition to developing technologies for commercial application in the developed world, Intellectual Ventures works with governments, NGOs, and academic and

research organizations from all over the world, leveraging IV's inventions to make commercialization of life-saving inventions in the developing world feasible. This work is done through Global Good, a collaboration between Intellectual Ventures and Bill Gates, and has created technologies including the Arktek™ passive vaccine storage device. In 2016, Arktek was awarded the United States Patents & Trademark Office's "Patents for Humanity" Award for using technology to meet global humanitarian challenges.

25. Intellectual Ventures' business includes purchasing important inventions from individual inventors and institutions and then licensing the inventions to those who need them. Through this business, Intellectual Ventures enables inventors to reap a financial reward from their innovations, which is often a difficult task for individual inventors.

The T-Mobile Network

26. The T-Mobile Defendants are in the business of providing wireless telephone services to customers throughout the United States, including the state of Texas, under the T-Mobile and MetroPCS brands. In conjunction with their partners, the Ericsson Defendants, the T-Mobile Defendants have deployed a wireless network according to the LTE telecommunications standard.

27. As a result of the expansion of their LTE network, the T-Mobile Defendants have been enormously successful in increasing their customer base. By the end of the first quarter of 2017, the T-Mobile Defendants had approximately 73 million wireless customers nationwide, and their annual revenue for 2016 was nearly $27.8 billion.

28. Much of the equipment installed in the accused LTE network was acquired from the T-Mobile Defendants' longtime business partners, the Ericsson Defendants, which design,

manufacture, import and sell LTE telecommunications equipment, including LTE base stations, known as eNodeBs.

29. Upon information and belief, the T-Mobile Defendants are currently engaged in testing and rolling out LTE services generally referred to as 4.5G, 4.9G, and 5G with all of their radio access network vendors. Testing is currently underway with respect to one or more of these advanced systems, which upon information and belief, incorporate infringing technology.

T-Mobile's Vendor Partnerships

30. In or about 2012, the T-Mobile Defendants selected Ericsson to provide and deploy LTE cellular equipment.

31. The T-Mobile and Ericsson Defendants work closely together in the deployment, testing, and servicing of the T-Mobile Defendants' network. Ericsson touts that "Ericsson's strong design and solution capabilities enable the T-Mobile Defendants to deploy the most advanced LTE networks for its subscribers." (https://www.ericsson.com/en/press-releases/2017/1/2068787-t-mobile-and-ericsson-first-in-north-america-to-demonstrate-nearly-1-gbps-lte-over-the-air-on-commercially-available-network-equipment-and-software). Ericsson also advertises how "[w]ith Ericsson's support, T-Mobile provides nationwide [Enhanced Voice Service] support for VoLTE . . . calling users." (https://www.ericsson.com/en/news/2016/6/enhanced-hd-voice-for-volte-launched-by-t-mobile-and-ericsson).

32. The T-Mobile and Ericsson Defendants continue to closely collaborate in the deployment of the T-Mobile Defendants' LTE network, the operation of which infringes IV's asserted patents. For example, "Ericsson and T-Mobile are working together on a network evolution plan and optimization path to . . . . maximize the success of LTE."

(https://www.ericsson.com/en/press-releases/2017/2/2082064-ericsson-and-t-mobile-pioneering-superior-lte-network-capabilities-in-readiness-for-5g-deployments). The T-Mobile and Ericsson Defendants also announced that their collaboration will extend into the deployment of 5G. (https://newsroom.t-mobile.com/news-and-blogs/nationwide-5g.htm, quoting Borje Ekholm, President and CEO of Ericsson: "We will support T-Mobile US with 5G radio development for [the 600MHz spectrum]."). More recently, the T-Mobile and Ericsson Defendants partnered to deploy commercially available Ericsson LTE hardware and software capable of gigabit speeds, and they have announced their intention to cooperate on the installation of 600MHz equipment.

COUNT I

Infringement of the `357 Patent by All Defendants

33. Paragraphs 1 through 32 are incorporated by reference as if fully restated herein.

34. The T-Mobile Defendants own, maintain, operate, and use mobile telecommunication networks in conformance with 3rd Generation Partnership Project ("3GPP") LTE related standards. *See, e.g.*, https://www.ericsson.com/res/docs/2015/ericsson-3gpp-submission-study-whitepaper-may-2015.pdf, https://www.t-mobile.com/coverage/4g-lte-network. The T-Mobile network includes eNodeB devices and other equipment provided by the Ericsson Defendants. The T-Mobile Defendants also sell LTE-compliant phones to their subscribers for use in accessing the T-Mobile network pursuant to telecommunications service contracts. *See, e.g.*, www.t-mobile.com/cell-phones. The Ericsson Defendants install, test, and service eNodeBs and other equipment within T-Mobile's LTE network.

35. Wireless transmissions between an eNodeB and a User Equipment ("UE," *e.g.*, a Smart Phone) include downlink transmissions from the eNodeB to the UE and uplink transmissions from the UE to the eNodeB. 3rd Generation Partnership Project; Technical

Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 8), 3GPP TS 36.300 V8.9.0 (2009-06) and all other versions thereof ("TS 36.300") §§ 5-6. Each UE periodically enters an idle mode, which is a sleep mode used to conserve power and radio resources whenever a UE is not engaged in operations that require more frequent communication with an eNodeB. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode (Release 8) 3GPP TS 36.304 V8.2.0 (2008-05) and all other versions thereof ("TS 36.304") § 7.1. During idle mode, the UE monitors only one subframe per a given time cycle for a Downlink Control Information ("DCI") message having an identifier associated with the UE. *See id.*; *see also* 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures (Release 8), 3GPP TS 36.213 V8.8.0 (2009-09) and all other versions thereof ("TS 36.213").

36. When a UE is to awaken from idle mode, the eNodeB receives a paging procedure message relating to the UE from other equipment in the T-Mobile network. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP), 3GPP TS 36.413 V8.4.0 (2008-12) and all other versions thereof ("TS 36.413") §§ 8.5, 9.1.6. In response to receiving the paging procedure message, the eNodeB sends a DCI message carrying information in a subframe assigned to a group of UEs including the UE that is to be awakened. TS 36.304 § 7.1. The DCI message includes an allocation of resources for a shared channel that is to be read subsequently by all UEs in the group. *See* TS 36.213 § 7.1; *see also* 3rd Generation

Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and Channel Coding, 3GPP TS 36.212 V8.8.0 (2009-12) and all other versions thereof ("TS 36.212") §§ 5.3.3.1.3 & 5.3.3.1.4. If the UE recognizes an identifier in its assigned subframe, it looks in the allocation of resources on the shared channel for a paging message. *See* TS 36.213 § 7.1; *see also* 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol Specification (Release 8), 3GPP TS 36.331 V8.5.0 (2009-03) and all other versions thereof ("TS 36.331") § 6.2.2. If the paging message includes the UE's International Mobile Subscriber Identity ("IMSI") or Temporary Mobile Subscriber Identity ("TMSI"), the UE awakens from idle mode. *Id*.

37. On information and belief, the T-Mobile and Ericsson Defendants have directly infringed at least claims 11 and 30 of the `357 patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs and other equipment in T-Mobile's network to effect the paging of an idle UE device in the manner described above.

38. The T-Mobile Defendants have also directly infringed, and continue to infringe, at least claim 47 of the `357 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by T-Mobile subscribers in a manner that results in control of the above-described paging process. The T-Mobile Defendants are directly responsible for all functions performed by each UE that relate to communicating with the T-Mobile network. The T-Mobile Defendants direct and control all communication operations of UEs in the T-Mobile network by using an eNodeB to send signals to page an idle UE through the above-described paging process. In many cases, T-Mobile sells UEs to its subscribers along with provision of telecom services. T-Mobile also requires that in order to communicate with its network, each

UE must comply with certain LTE standards. Thus, the operations of UEs in the T-Mobile network are "attributable to" the T-Mobile Defendants for purposes of establishing direct infringement of claim 47 of the `357 Patent. *See Akamai Techs., Inc. v. Limelight Networks, Inc.*, 797 F.3d 1020, 1022-23 (Fed. Cir. 2015).

39. Moreover, T-Mobile directly infringes at least claim 47 because T-Mobile "conditioned receipt of a benefit" (*i.e.,* the ability of each T-Mobile subscriber to enjoy T-Mobile's LTE telecom services) upon use of an LTE-compliant UE monitoring and responding to DCI messages and other signals sent by eNodeBs in T-Mobile's network, and T-Mobile established the "manner or timing of that performance" by providing LTE-compliant phones to its subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), and further by transmitting specific DCI messages, paging messages, and other signals to the UE in accordance with the above-described paging process. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A T-Mobile subscriber could not possibly enjoy the benefits of T-Mobile's LTE telecom services without using an LTE-compliant UE that monitors for and responds to specific DCI messages, paging messages, and other signals sent by eNodeBs in the manner specified above. Thus, T-Mobile is liable for directly infringing at least claim 47 under 35 U.S.C. § 271(a).

40. The T-Mobile Defendants have also induced infringement of at least claim 47 by T-Mobile subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for T-Mobile subscribers to communicate with the T-Mobile network, along with instructions that induce T-Mobile subscribers to perform the steps of claim 47 upon using UEs to communicate with the T-Mobile network.

41. On information and belief, the T-Mobile Defendants take active steps to induce infringement of at least claim 47 by T-Mobile subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by T-Mobile subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send DCI messages along with other signals to cause a UE to monitor for and receive such messages and signals and awaken from idle mode, and also by requiring use of LTE-compliant UEs specifically for the purpose of performing the infringing paging functions recited in claim 47.

42. By way of at least this Complaint, the T-Mobile Defendants know of the `357 patent and perform acts that they know, or should know, induce the direct infringement of claim 47 of the `357 Patent by T-Mobile subscribers. Thus, the T-Mobile Defendants are indirectly liable for infringement of at least claim 47 pursuant to 35 U.S.C. §§ 271(b).

43. On information and belief, the Ericsson Defendants have induced infringement of at least claims 11 and 30 by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 11 and 30 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to perform the claimed methods, along with instructions that induce the T-Mobile Defendants to perform the claimed methods.

44. On information and belief, the Ericsson Defendants take active steps to induce infringement of at least claims 11 and 30 by the T-Mobile Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring eNodeB equipment to receive paging messages from other equipment in the T-Mobile network and to send signals to page an idle UE, providing T-Mobile with instructions on the use of the

above-described paging feature, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in T-Mobile's network specifically for the purpose of performing the infringing methods.

45. On information and belief, the Ericsson Defendants know or should know that such activities induce the T-Mobile Defendants to infringe at least claims 11 and 30 of the `357 Patent by performing the claimed methods from at least the date of the filing of this Complaint.

46. On information and belief, the Ericsson Defendants also contribute to the infringement of at least claims 11 and 30 by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules that are capable of implementing the above-described paging feature. The accused paging software is especially adapted for use in the infringing paging functions, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least claims 11 and 30 by performing the claimed methods.

47. By way of at least this Complaint, the Ericsson Defendants know of the `357 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 11 and 30 of the `357 Patent by the T-Mobile Defendants. Thus, the Ericsson Defendants are indirectly liable for infringement of at least claims 11 and 30 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

48. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `357 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all

Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `357 Patent and that the `357 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `357 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `357 Patent.

COUNT II

Infringement of the `828 Patent by All Defendants

49. Paragraphs 1 through 48 are incorporated by reference as if fully restated herein.

50. Wireless transmissions between an eNodeB and a UE include downlink transmissions from the eNodeB to the UE and uplink transmissions from the UE to the eNodeB. TS 36.300 §§ 5-6. Each UE communicating with an eNodeB in a cell must obtain permission from the eNodeB to use uplink resources that are shared by all UEs in the cell. *Id*. When the eNodeB detects that a UE needs to send uplink data, it sends a DCI message to the UE indicating a grant of specified uplink resources. *See* TS 36.213 §§ 3, 6.8, and 7.1.6. In each instance of infringement, the DCI message also carries a Transmit Power Control ("TPC") command indicating a power adjustment value. *Id.* § 5.3.3.1.1. During operation in an accumulation mode, the TPC commands require that power adjustment values must be accumulated with previously transmitted values. TS 36.213 §§ 5.1.1.1. When accumulation mode is not enabled, the values carried by the TPC commands are not accumulated. *Id*. As a result of sending TPC

commands and other signals in the manner described above, the eNodeBs in T-Mobile's network control power levels of signals received from UEs at the eNodeB. *Id*.

51. On information and belief, the T-Mobile and Ericsson Defendants have directly infringed at least claims 15 and 29 of the `828 Patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs in T-Mobile's network to control power levels of signals generated at UEs in the manner described above.

52. The T-Mobile Defendants have also directly infringed, and continue to infringe, at least claim 1 of the `828 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by T-Mobile subscribers in a manner that results in control of uplink power transmission levels. The T-Mobile Defendants are directly responsible for all functions performed by each UE communicating with the T-Mobile network. The T-Mobile Defendants direct and control all communication operations of UEs in the T-Mobile network by using an eNodeB to send TPC commands and other signals to control the power levels. In many cases, T-Mobile sells UEs to its subscribers along with provision of telecom services. T-Mobile also requires that in order to communicate with its network, each UE must comply with certain LTE standards. Thus, the operations of UEs in the T-Mobile network are "attributable to" the T-Mobile Defendants for purposes of establishing direct infringement of claim 1 of the `828 Patent. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23.

53. Moreover, T-Mobile directly infringes claim 1 because T-Mobile "conditioned receipt of a benefit" (*i.e.*, the ability of each T-Mobile subscriber to enjoy T-Mobile's LTE telecom services) upon use of an LTE-compliant UE responding to uplink power control commands and other signals sent by eNodeBs in T-Mobile's network, and T-Mobile established the "manner or timing of that performance" by providing LTE-compliant phones to its

subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), and further by transmitting TPC commands and other signals to the UE. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A T-Mobile subscriber could not possibly enjoy the benefits of T-Mobile's LTE telecom services without using an LTE-compliant UE that responds to TPC commands and other signals sent by eNodeBs in the specified manner. Thus, T-Mobile is liable for directly infringing claim 1 under 35 U.S.C. § 271(a).

54. The T-Mobile Defendants have also induced infringement of at least claim 1 by T-Mobile subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for the subscribers to communicate with the T-Mobile network, along with instructions that induce T-Mobile subscribers to operate the claimed "user equipment" in a manner that satisfies all of the limitations of claim 1 upon interaction with the T-Mobile network.

55. On information and belief, the T-Mobile Defendants take active steps to induce infringement of claim 1 by T-Mobile subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by T-Mobile subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send TPC commands along with other signals to cause a UE to control uplink power in an infringing manner, and also by requiring use of LTE-compliant phones specifically for the purpose of performing the infringing uplink power control functions recited in claim 1.

56. By way of at least this Complaint, the T-Mobile Defendants know of the `828 patent and perform acts that they know, or should know, induce the direct infringement of claim 1 of the `828 Patent by T-Mobile subscribers. Thus, the T-Mobile Defendants are liable for indirect infringement of at least claim 1 pursuant to 35 U.S.C. §§ 271(b).

57. On information and belief, the Ericsson Defendants have induced infringement of at least claims 15 and 29 by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 15 and 29 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to perform the claimed methods, along with instructions that induce the T-Mobile Defendants to perform the claimed methods.

58. On information and belief, the Ericsson Defendants take active steps to induce infringement of at least claims 15 and 29 by the T-Mobile Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Upon information and belief, such active steps include, but are not limited to, configuring eNodeB equipment to send TPC commands and other signals that control power levels, providing T-Mobile with instructions on the use of the accused power control feature, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in T-Mobile's network specifically for the purpose of performing the infringing methods.

59. On information and belief, the Ericsson Defendants know or should know that such activities induce the T-Mobile Defendants to infringe at least claims 15 and 29 of the `828 Patent by performing the claimed methods, from at least the date of the filing of this Complaint.

60. On information and belief, the Ericsson Defendants also contribute to the infringement of at least claims 15 and 29 by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules that are capable of controlling uplink power levels in the manner described above. The accused power control

software is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least claims 15 and 29 by performing the claimed methods.

61. By way of at least this Complaint, the Ericsson Defendants know of the `828 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 15 and 29 of the `828 Patent by the T-Mobile Defendants. Thus, the Ericsson Defendants are indirectly liable for infringement of at least claims 15 and 29 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

62. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `828 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `828 Patent and that the `828 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `828 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `828 Patent.

COUNT III

Infringement of the `641 Patent by the T-Mobile and Ericsson Defendants

63. Paragraphs 1 through 62 are incorporated by reference as if fully restated herein.

64. Broadly speaking, the `641 Patent claims devices and methods for communicating from a cell tower to a cell phone in a modern LTE cellular network, often referred to as a "4G-LTE" network. The `641 Patent claims generally include the ability to use a variable channel bandwidth over which that communication occurs. *See, e.g.*, `641 Patent at Abstract. This ability gives cellular network operators (like the T-Mobile and Ericsson Defendants) the flexibility they need to maximize the quality, speed and capacity of their networks, despite limits on the amounts amount of frequency spectrum and number of cell towers that are available in any single place. *See generally* `641 Patent at 1:31-2:03.

65. The T-Mobile Defendants own, maintain, operate, and use a mobile telecommunication network in conformance with 3GPP LTE-related standards. *See, e.g.*, https://www.ericsson.com/ res/docs/2015/ericsson-3gpp-submission-study-whitepaper-may-2015.pdf; https://www.t-mobile.com/ coverage/4g-lte-network. The T-Mobile network includes LTE-compliant base stations (such as cell phone towers) comprising LTE-compliant eNodeB devices that are provided by Ericsson. Upon information and belief, the T-Mobile network also includes other equipment provided and/or installed by Ericsson. The T-Mobile Defendants also import and sell LTE-compliant UEs (or "mobile stations," such as cell phones) to subscribers and/or set up subscribers' mobile stations for use in accessing the T-Mobile network pursuant to telecommunications service contracts. *See, e.g.*, www.t-mobile.com/cell-phones.

66. Upon information and belief, the Ericsson Defendants install, test, and service eNodeBs and other equipment within T-Mobile's LTE network.

67. LTE downlink signals from an eNodeB base station to a mobile station use orthogonal frequency division multiple access (OFDMA) over an operating channel with a center frequency. *See, e.g.*, 3GPP Technical Specification Group Radio Access Network Evolved

Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE) radio transmission and reception (Release 8), 3GPP TS 36.101 V8.11.0 (2010-10), and all other versions thereof ("TS 36.101") § 5; 3GPP Technical Specifications Group Radio Access Network E-UTRA Base Station (BS) radio transmission and Reception (Release 8), 3GPP TS 36.104 V.8.10.0 (2010-06), and all other versions thereof ("TS 36.104") § 5; 3GPP Technical Specification Group Radio Access Network E-UTRA LTE Physical Layer – General Description (Release 8), 3GPP TS 36.201 V.8.3.0 (2009-03), and all other versions thereof § 4.2.1. The center frequency can vary within the frequency spectrum ranges permitted by the Technical Standards and the ranges licensed by the government or leased for the network. *See* TS 36.101 § 5.5; TS 36.104 § 5.5, 5.7.2-3. The downlink signal is an E-UTRA signal comprising multiple subcarriers which carry data and control channels. *See* 3GPP Technical Specification Group Radio Access Network; E-UTRA Physical Channels and Modulation (Release 8), 3GPP TS 36.211 V.8.9.0 (2009-12), and all other versions thereof ("TS 36.211") § 6.2.1.

68. An eNodeB base station and a mobile station must first establish an initial connection or a handoff connection. The base station transmits and the mobile station receives signals of a broadcast channel in a first band or "core band" centered at the center frequency of the operating channel. *See* TS 36.211 § 6.6.4; TS 36.212 §§ 4, 4.2; TS 36.300 § 5.1. The core band has 6 subcarrier groups or resource blocks comprising 72 subcarriers with a fixed spacing at 15kHz. *See* TS 36.300 § 5.1, TS 36.104 §§ 5.6, 6.2.4; TS 36.211 §§ 6.2.3, 6.6.4; TS 36.300 § 5.1.1. The core band includes broadcast information and primary and secondary synchronization information which the mobile stations use to synchronize with the eNodeB base station. *See* TS 36.211 §§ 6.1.2, 6.11.1, TS 36.213 § 4; TS 36.304 § 5.1.

69. Following the connection between the eNodeB base station and the mobile station, the eNodeB base station can then downlink data (web pages, photographs, video, etc.) to the mobile station over the operating channel. The operating channel has a second band whose bandwidth is transmitted in the broadcast information and which can have six possible values—1.4, 3, 5, 10, 15, or 20 MHz—each of which includes the core band. TS 36.104 § 5.6; TS 36.101 § 5.6.1, TS 36.211 § 6.6.4; TS 36.300 § 5.1; TS 36.331 §§ 6.2.1, 6.2.2. These six different bandwidths include different numbers of subcarriers; thus, a variable operating channel bandwidth is realized by adjustment of the number of useable subcarriers.

70. In the T-Mobile network, eNodeB base stations are configured to and do select a channel bandwidth between some or all of the six possible channel bandwidths, depending on which center frequency is being used, on which eNodeB base station and cell is being used, and on how the eNodeB has been set up, and on how the network is operated. This occurs when, for example, an eNodeB base station is commissioned or configured to transmit a downlink signal at a particular operating channel bandwidth, when an eNodeB base station is reconfigured to transmit a downlink signal at a different operating channel bandwidth, when an eNodeB base station has multiple cells with different operating channel bandwidths, and when an eNodeB base station initially communicates with a mobile station over a core bandwidth and subsequently communicates with a mobile station over the larger operating channel bandwidth.

71. In addition, another method of operating the T-Mobile network (and configuration of eNodeB base stations) is called "carrier aggregation." Carrier aggregation is a part of fifth-generation or "5G" technology. Carrier aggregation aggregates different LTE carriers into virtual carriers with broader bandwidths. Upon information and belief, the T-Mobile and/or the Ericsson Defendants have used, tested, and/or intend to deploy eNodeB base stations in the

network that adjust the number of useable subcarriers and realize a variable operating channel bandwidth using carrier aggregation.

72. On information and belief, the T-Mobile and Ericsson Defendants have directly infringed at least claim 1 of the `641 Patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs and other equipment in T-Mobile's network as discussed above.

73. The T-Mobile Defendants have directly infringed at least claim 11 of the `641 Patent under 35 U.S.C. § 271(a) by selling infringing LTE-compliant phones and other UEs to their own subscribers.

74. The T-Mobile Defendants have directly infringed, and continue to infringe, at least claims 6, 11, and 25 of the `641 Patent under 35 U.S.C. § 271(a) because they "condition[] receipt of a benefit" (i.e., the ability of each T-Mobile subscriber to enjoy T-Mobile's LTE telecom services) upon use of an LTE-compliant mobile station, and because they established the "manner or timing of that performance" by providing LTE-compliant mobile stations to subscribers along with LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), in accordance with the claims. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A subscriber could not possibly enjoy the benefits of the network without using an LTE-compliant mobile station that practices the claims.

75. Moreover, the operations of eNodeB base stations and mobile stations in the T-Mobile network are "attributable to" the T-Mobile and Ericsson Defendants because they require operations in accordance with the LTE standards and that infringe at least claims 6 and 25 of the `641 Patent. *Id.* Thus, the T-Mobile Defendants have directly infringed at least claims 6 and 25 of the `641 Patent under 35 U.S.C. § 271(a).

76. The T-Mobile Defendants have also induced infringement of at least claims 6, 11, and 25 of the `641 Patent by T-Mobile subscribers in violation of 35 U.S.C. § 271(b) by selling (or requiring use of) LTE complaint UEs necessary for the subscribers to communicate with the T-Mobile network, along with instructions that induce T-Mobile subscribers to operate the claimed "user equipment" in a manner that satisfies all of the limitations of claims 6, 11, and 25 upon interaction with the T-Mobile network.

77. On information and belief, the T-Mobile Defendants take active steps to induce infringement of claims 6, 11, and 25 by T-Mobile subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by T-Mobile subscribers in violation of 35 U.S.C. § 271(b). Such active steps of inducement include, but are not limited to, advertising, selling, and otherwise furnishing (or requiring use of) LTE-compliant UEs necessary for T-Mobile subscribers to communicate with the T-Mobile network (with instructions on their use), including furnishing eNodeB base stations for use by subscribers' LTE-compliant UEs, configuring subscriber UEs, and otherwise providing subscribers with the ability to automatically access the T-Mobile network.

78. By way of at least this Complaint, the T-Mobile Defendants know of the `641 patent and perform acts that they know, or should know, induce the direct infringement of claims 6, 11, and 25 of the `641 Patent by T-Mobile subscribers. Thus, the T-Mobile Defendants are indirectly liable for infringement of at least claims 6, 11, and 25 pursuant to 35 U.S.C. §§ 271(b).

79. On information and belief, the Ericsson Defendants have directly infringed claim 1 under 35 U.S.C. § 271(a), by selling eNodeBs and related equipment to T-Mobile and by making and using the infringing T-Mobile equipment during the course of installation and maintenance.

80. On information and belief, the Ericsson Defendants have induced infringement of at least claim 1 of the `641 Patent, by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claim 1 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to use the claimed devices and networks, along with instructions that induce the T-Mobile Defendants use the claimed devices and networks.

81. On information and belief, the Ericsson Defendants take active steps to induce infringement of at least claim 1 by the T-Mobile Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, providing T-Mobile with instructions on the use of the accused features, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in T-Mobile's network specifically for the purpose of using the claimed equipment.

82. On information and belief, the Ericsson Defendants know or should know that such activities induce the T-Mobile Defendants to infringe at least claim 1 of the `641 Patent by using the claimed devices and networks, from at least the date of the filing of this Complaint.

83. On information and belief, the Ericsson Defendants also contribute to the infringement of at least claim 1 by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules that are capable of operating in the manner described above. The accused eNodeB software is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the

Ericsson Defendants know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least claim 1 by the claimed equipment.

84. By way of at least this Complaint, the Ericsson Defendants know of the `641 Patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of at least claims 1 of the `641 Patent. Thus, the Ericsson Defendants are indirectly liable for infringement of at least claim 1 of the `641 Patent pursuant to 35 U.S.C. §§ 271(b) and 271(c).

85. The T-Mobile and Ericsson Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `641 Patent, which has been duly issued by the PTO and is presumed valid. For example, the T-Mobile and Ericsson Defendants participated in litigation regarding the parent patent of the `641 Patent. Similarly, the Ericsson Defendants were petitioners in two *inter partes* review trials concerning the same parent patent of the `641 Patent (i.e., the `431 Patent), and in those proceedings were informed of a child of the `641 Patent, of the relationship between the parent and the child (which includes the `641 Patent), of claim constructions relevant to the `641 Patent claims, and that the PTAB held that at least one element of claim 1 (and the other independent claims) of the `641 Patent was not found in the prior art. Upon information and belief, the T-Mobile Defendants were similarly aware of the two *inter partes* review trials. Moreover, service of this Complaint provides notice of infringement hereafter. In addition, since at least the filing of this action, the T-Mobile and Ericsson Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `641 Patent and that the `641 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `641 Patent. Despite

that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `641 Patent.

COUNT IV

Infringement of the `018 Patent by All Defendants

86. Paragraphs 1 through 85 are incorporated by reference as if fully restated herein.

87. Wireless transmissions between an eNodeB and a UE include downlink transmissions from the eNodeB to the UE, and uplink transmissions from the UE to the eNodeB. TS 36.300 §§ 5-6. Each UE communicating with an eNodeB in a cell must obtain permission from the eNodeB to use uplink resources that are shared by all UEs in the cell. *Id*. When the eNodeB detects that a UE needs to send uplink data, it sends a DCI message to the UE indicating a grant of specified uplink resources (an "allocation message"). *See* TS 36.213 §§ 3, 6.8, and 7.1.6.

88. The eNodeB and/or other equipment in the T-Mobile network establishes bearers for data flows to be transmitted over the radio interface between the eNodeB and a UE. TS 36.300 § 13. Different bearers may have different quality of service requirements appropriate for corresponding data flows. *Id.* The eNodeB also communicates a Prioritized Bit Rate (PBR) for each bearer that the eNodeB establishes for transmission from the UE to the eNodeB. TS 36.331 §§ 4.4, 6.2. The UE uses the PBR for each logical channel to iteratively calculate another value, B_j, for that channel. *See* 3rd Generation Partnership Project; LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 8), 3GPP TS 36.321 V8.8.0 (2010-02), and all other versions thereof ("TS 36.321") § 5.4.3.1. B_j increases at defined time intervals by a value specified by the PBR, and decreases as data is

transmitted from the UE to the eNodeB. *Id.* The UE transmits data from logical channels having a B_j greater than zero before transmitting data from logical channels having a B_j less than or equal to zero. *Id.*

89. On information and belief, the T-Mobile and Ericsson Defendants have directly infringed at least claims method 12 and 20 of the `018 Patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs in T-Mobile's network to communicate PBR for logical channels, to send allocation messages to UEs and to receive data from UEs.

90. The T-Mobile Defendants have also directly infringed, and continue to infringe at least claim 24 of the `018 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by T-Mobile subscribers in a manner that results in prioritizing logical channels according to claim 24. The T-Mobile Defendants are directly responsible for all functions performed by each UE communicating with the T-Mobile network. The T-Mobile Defendants direct and control all communication operations of UEs in the T-Mobile network by using an eNodeB to send PBR and allocation messages. In many cases, T-Mobile sells UEs to its subscribers along with provision of telecom services. T-Mobile also requires that in order to communicate with its network, each UE must comply with certain LTE standards. Thus, the operations of UEs in the T-Mobile network are "attributable to" the T-Mobile Defendants for purposes of establishing direct infringement of claim 24 of the `018 Patent. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23.

91. Moreover, the T-Mobile Defendants directly infringe claim 24 because T-Mobile "conditioned receipt of a benefit" (*i.e.*, the ability of each T-Mobile subscriber to enjoy T-Mobile's LTE telecom services) upon use of an LTE-compliant UE responding to PBR and allocation messages sent by eNodeBs in T-Mobile's network, and T-Mobile established the

"manner or timing of that performance" by providing LTE-compliant phones to its subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), and further by transmitting PBR and allocation messages to the UE. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A T-Mobile subscriber could not possibly enjoy the benefits of T-Mobile's LTE telecom services without using an LTE-compliant UE that responds to PBR and allocation messages sent by eNodeBs in the specified manner. Thus, the T-Mobile Defendants are liable for directly infringing claim 24 under 35 U.S.C. § 271(a).

92. The T-Mobile Defendants have also induced infringement of at least claim 24 by T-Mobile subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for the subscribers to communicate with the T-Mobile network, along with instructions that induce T-Mobile subscribers to operate the claimed "user equipment" in a manner that satisfies all of the limitations of claim 24 upon interaction with the T-Mobile network.

93. On information and belief, the T-Mobile Defendants take active steps to induce infringement of claim 24 by T-Mobile subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by T-Mobile subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send PBR and allocation messages to cause a UE to prioritize logical channels in an infringing manner, and also by requiring use of LTE-compliant phones specifically for the purpose of performing the logical channel prioritization functions recited in claim 24.

94. By way of at least this Complaint, the T-Mobile Defendants know of the `018 patent and perform acts that they know, or should know, induce the direct infringement of claim

24 of the `018 Patent by T-Mobile subscribers. Thus, the T-Mobile Defendants are indirectly liable for infringement of at least claim 24 pursuant to 35 U.S.C. §§ 271(b).

95. On information and belief, the Ericsson Defendants have induced infringement of at least claims 12 and 20 by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 12 and 20 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to perform the claimed methods, along with instructions that induce the T-Mobile Defendants to perform the claimed methods.

96. On information and belief, the Ericsson Defendants take active steps to induce infringement of at least claims 12 and 20 by the T-Mobile Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring eNodeB equipment to send PBR information and allocation messages, providing T-Mobile with instructions on the use of the accused features, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in T-Mobile's network specifically for the purpose of performing the infringing methods.

97. On information and belief, the Ericsson Defendants know or should know that such activities induce the T-Mobile Defendants to infringe at least claims 12 and 20 of the `018 Patent by performing the claimed methods, from at least the filing of this Complaint.

98. On information and belief, the Ericsson Defendants also contribute to the infringement of at least claims 12 and 20 by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules that are capable of

transmitting a PBR and allocating bandwidth in the manner described above. The accused eNodeB software is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least claims 12 and 20 by performing the claimed methods.

99. By way of at least this Complaint, the Ericsson Defendants know of the `018 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 12 and 20 of the `018 Patent by the T-Mobile Defendants. Thus, the Ericsson Defendants are indirectly liable for infringement of at least claims 12 and 20 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

100. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `018 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `018 Patent and that the `018 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `018 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `018 Patent.

COUNT V

Infringement of the `330 Patent by All Defendants

101. Paragraphs 1 through 100 are incorporated by reference as if fully restated herein.

102. Wireless transmissions between an eNodeB and a UE include downlink transmissions from the eNodeB to the UE and uplink transmissions from the UE to the eNodeB. TS 36.300 §§ 5-6. Each UE periodically enters an idle mode, which is a sleep mode used to conserve power and radio resources whenever a UE is not engaged in operations that require more frequent communication with an eNodeB. TS 36.304 § 7.1. During idle mode, the UE monitors only one subframe per a given time cycle for a DCI message having an identifier associated with the UE. *See id.*; *see also* TS 36.213.

103. When a UE is to awaken from idle mode, the eNodeB receives a paging procedure message relating to the UE from other equipment in the T-Mobile network. TS 36.413 §§ 8.5, 9.1.6. In response to receiving the paging procedure message, the eNodeB sends a DCI message carrying information in a subframe assigned to a group of UEs including the UE that is to be awakened. 3GPP TS 36.304 V8.2.0 § 7.1. The DCI message includes an allocation of resources for a shared channel that is to be read subsequently by all UEs in the group. *See* TS 36.213 § 7.1; *see also* TS 36.212 §§ 5.3.3.1.3 & 5.3.3.1.4. If the UE recognizes an identifier in its assigned subframe, it looks in the allocation of resources on the shared channel for a paging message. *See* TS 36.213 § 7.1; *see also* TS 36.331 § 6.2.2. If the paging message includes the UE's International Mobile Subscriber Identity ("IMSI") or Temporary Mobile Subscriber Identity ("TMSI"), the UE awakens from idle mode. *Id.*; *see also* TS 36.331 § 6.2.2.

104. On information and belief, the T-Mobile and Ericsson Defendants have directly infringed at least claims 1 and 18 of the `330 patent under 35 U.S.C. § 271(a) by using,

installing, testing, and/or maintaining eNodeBs and other equipment in T-Mobile's network to effect the paging of an idle UE device in the manner described above. The T-Mobile Defendants have also directly infringed, and continue to infringe at least claim 9 of the `330 Patent under 35 U.S.C. § 271(a) by selling infringing LTE-compliant phones and other UEs to their own subscribers.

105. The T-Mobile Defendants have also directly infringed, and continue to infringe, at least claims 9 and 26 of the `330 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by T-Mobile subscribers in a manner that results in control of the above-described paging process. The T-Mobile Defendants are directly responsible for all functions performed by each UE that relate to communicating with the T-Mobile network. The T-Mobile Defendants direct and control all communication operations of UEs in the T-Mobile network by using an eNodeB to send signals to page an idle UE through the above-described paging process. In many cases, T-Mobile sells UEs to its subscribers along with provision of telecom services. T-Mobile also requires that in order to communicate with its network, each UE must comply with certain LTE standards. Thus, the operations of UEs in the T-Mobile network are "attributable to" the T-Mobile Defendants for purposes of establishing direct infringement of claims 9 and 26 of the `330 Patent. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23.

106. Moreover, the T-Mobile Defendants directly infringe claims 9 and 26 because they "conditioned receipt of a benefit" (*i.e.*, the ability of each T-Mobile subscriber to enjoy T-Mobile's LTE telecom services) upon use of an LTE-compliant UE monitoring and responding to DCI messages and other signals sent by eNodeBs in T-Mobile's network, and T-Mobile established the "manner or timing of that performance" by providing LTE-compliant

phones to its subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), and further by transmitting specific DCI messages, paging messages, and other signals to the UE in accordance with the above-described paging process. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A T-Mobile subscriber could not possibly enjoy the benefits of T-Mobile's LTE telecom services without using an LTE-compliant UE that monitors for and responds to specific DCI messages, paging messages, and other signals sent by eNodeBs in the manner specified above. Thus, the T-Mobile Defendants are liable for directly infringing claims 9 and 26 under 35 U.S.C. § 271(a).

107. The T-Mobile Defendants have also induced infringement of at least claims 9 and 26 by T-Mobile subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for T-Mobile subscribers to communicate with the T-Mobile network, along with instructions that induce T-Mobile subscribers to perform the steps of claim 26 upon using UEs to communicate with the T-Mobile network.

108. On information and belief, the T-Mobile Defendants take active steps to induce infringement of claims 9 and 26 by T-Mobile subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by T-Mobile subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send DCI messages along with other signals to cause a UE to monitor for and receive such messages and signals and awaken from idle mode, and also by requiring use of LTE-compliant UEs specifically for the purpose of performing the infringing paging functions recited in claims 9 and 26.

109. By way of at least this Complaint, the T-Mobile Defendants know of the `330 patent and perform acts that they know, or should know, induce the direct infringement of claims

9 and 26 of the `330 Patent by T-Mobile subscribers. Thus, the T-Mobile Defendants are indirectly liable for infringement of at least claims 9 and 26 pursuant to 35 U.S.C. §§ 271(b).

110. Upon information and belief, the Ericsson Defendants have directly infringed claim 1 under 35 U.S.C. § 271(a) by selling eNodeBs and related equipment to T-Mobile and by making and using the infringing T-Mobile equipment during the course of installation and maintenance.

111. On information and belief, the Ericsson Defendants have induced infringement of at least claims 1 and 18 by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 1 and 18 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to perform the claimed methods and use the claimed devices, along with instructions that induce the T-Mobile Defendants to perform the claimed methods and use the claimed devices.

112. On information and belief, the Ericsson Defendants take active steps to induce infringement of at least claims 1 and 18 by the T-Mobile Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring eNodeB equipment to receive paging messages from other equipment in the T-Mobile network and to send signals to page an idle UE, providing T-Mobile with instructions on the use of the above-described paging feature, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in T-Mobile's network specifically for the purpose of performing the infringing methods and using the claimed system and equipment.

113. On information and belief, the Ericsson Defendants know or should know that such activities induce the T-Mobile Defendants to infringe at least claims 1 and 18 of the `330

Patent by performing the claimed methods and using the claimed devices and networks, from at least the date of the filing of this Complaint.

114. On information and belief, the Ericsson Defendants also contribute to the infringement of at least claims 1 and 18 by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules that are capable of implementing the above-described paging feature. The accused paging software is especially adapted for use in the infringing paging functions, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least claims 1 and 18 by performing the claimed methods and using the claimed system and equipment.

115. By way of at least this Complaint, the Ericsson Defendants know of the `330 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 1 and 18 of the `330 Patent by the T-Mobile Defendants. Thus, the Ericsson Defendants are indirectly liable for infringement of at least claims 1 and 18 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

116. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `330 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `330 Patent and that the `330 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `330 Patent. In particular, the Defendants have been aware

of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `330 Patent.

COUNT VI

Infringement of the `466 Patent by All Defendants

117. Paragraphs 1 through 116 are incorporated by reference as if fully restated herein.

118. Wireless transmissions between an eNodeB and a UE include downlink transmissions from the eNodeB to the UE, and uplink transmissions from the UE to the eNodeB. TS 36.300 §§ 5-6. Each UE communicating with an eNodeB in a cell must obtain permission from the eNodeB to use uplink resources that are shared by all UEs in the cell. *Id*. When the eNodeB detects that a UE needs to send uplink data, it sends a DCI message to the UE indicating a grant of specified uplink resources (an "allocation message"). *See* TS 36.213 §§ 3, 6.8, and 7.1.6.

119. When a new bearer and corresponding logical channel is set up for communication between the eNodeB and the UE, that logical channel is assigned a Prioritized Bit Rate (PBR). *See* TS 36.331 §§ 4.4, 6.2. The UE uses the PBR for each logical channel to iteratively calculate another value, B_j, for that channel. *See* TS 36.321 § 5.4.3.1. B_j increases at defined time intervals by a value specified by the PBR, and decreases as data is transmitted from the UE to the eNodeB. *Id.* The UE transmits data from logical channels having a B_j greater than zero before transmitting data from logical channels having a B_j less than or equal to zero. *Id.*

120. On information and belief, the T-Mobile and Ericsson Defendants have directly infringed at least claims 4 and 9 of the `466 Patent under 35 U.S.C. § 271(a) by using, installing,

testing, and/or maintaining eNodeBs in T-Mobile's network to communicate PBR for logical channels, to send allocation messages to UEs and to receive data from UEs. The T-Mobile Defendants have also directly infringed, and continue to infringe at least claim 1 of the `466 Patent under 35 U.S.C. § 271(a) by selling infringing LTE-compliant phones and other UEs to their own subscribers.

121. The T-Mobile Defendants have also directly infringed, and continue to infringe at least claim 6 of the `466 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by T-Mobile subscribers in a manner that results in prioritizing logical channels according to claim 6. The T-Mobile Defendants are directly responsible for all functions performed by each UE communicating with the T-Mobile network. The T-Mobile Defendants direct and control all communication operations of UEs in the T-Mobile network by using an eNodeB to send PBR and allocation messages. In many cases, T-Mobile sells UEs to its subscribers along with provision of telecom services. The T-Mobile Defendants also require that in order to communicate with its network, each UE must comply with certain LTE standards. Thus, the operations of UEs in the T-Mobile network are "attributable to" the T-Mobile Defendants for purposes of establishing direct infringement of claim 6 of the `466 Patent. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23.

122. Moreover, the T-Mobile Defendants directly infringe claim 6 because T-Mobile "conditioned receipt of a benefit" (*i.e.*, the ability of each T-Mobile subscriber to enjoy T-Mobile's LTE telecom services) upon use of an LTE-compliant UE responding to PBR and allocation messages sent by eNodeBs in T-Mobile's network, and T-Mobile established the "manner or timing of that performance" by providing LTE-compliant phones to its subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant

phones obtained elsewhere), and further by transmitting PBR and allocation messages to the UE. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A T-Mobile subscriber could not possibly enjoy the benefits of T-Mobile's LTE telecom services without using an LTE-compliant UE that responds to PBR and allocation messages sent by eNodeBs in the specified manner. Thus, the T-Mobile Defendants are liable for directly infringing claim 6 under 35 U.S.C. § 271(a).

123. The T-Mobile Defendants have also induced infringement of at least claims 1 and 6 by T-Mobile subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for the subscribers to communicate with the T-Mobile network, along with instructions that induce T-Mobile subscribers to operate the claimed "user equipment" in a manner that satisfies all of the limitations of claims 1 and 6 upon interaction with the T-Mobile network.

124. On information and belief, the T-Mobile Defendants take active steps to induce infringement of claims 1 and 6 by T-Mobile subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by T-Mobile subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send PBR and allocation messages to cause a UE to prioritize logical channels in an infringing manner, and also by requiring use of LTE-compliant phones specifically for the purpose of performing the logical channel prioritization functions recited in claims 1 and 6.

125. By way of at least this Complaint, the T-Mobile Defendants know of the `466 patent and perform acts that they know, or should know, induce the direct infringement of claims 1 and 6 of the `466 Patent by T-Mobile subscribers. Thus, the T-Mobile Defendants are indirectly liable for infringement of at least claims 1 and 6 pursuant to 35 U.S.C. §§ 271(b).

126. On information and belief, the Ericsson Defendants have directly infringed claim 4 under 35 U.S.C. § 271(a), by selling eNodeBs and related equipment to T-Mobile and by making and using the infringing T-Mobile equipment during the course of installation and maintenance.

127. On information and belief, the Ericsson Defendants have induced infringement of at least claims 4 and 9 by the T-Mobile Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 4 and 9 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the T-Mobile Defendants to perform the claimed methods and use the claimed devices and networks, along with instructions that induce the T-Mobile Defendants to perform the claimed methods and use the claimed devices and networks.

128. On information and belief, the Ericsson Defendants take active steps to induce infringement of at least claims 4 and 9 by the T-Mobile Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the T-Mobile Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring eNodeB equipment to send PBR information and allocation messages, providing T-Mobile with instructions on the use of the accused features, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in T-Mobile's network specifically for the purpose of performing the infringing methods and using the claimed equipment.

129. On information and belief, the Ericsson Defendants know or should know that such activities induce the T-Mobile Defendants to infringe at least claims 4 and 9 of the `466 Patent by performing the claimed methods and using the claimed devices and networks, from at least the date of the filing of this Complaint.

130. On information and belief, the Ericsson Defendants also contribute to the infringement of at least claims 4 and 9 by the T-Mobile Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants that contribute to the infringement of the T-Mobile Defendants include providing eNodeB hardware and software modules that are capable of transmitting a PBR and allocating bandwidth in the manner described above. The accused eNodeB software is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants know or should know that such activities contribute to the T-Mobile Defendants' infringement of at least claims 4 and 9 by performing the claimed methods and using the claimed equipment.

131. By way of at least this Complaint, the Ericsson Defendants know of the `466 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 4 and 9 of the `466 Patent by the T-Mobile Defendants. Thus, the Ericsson Defendants are indirectly liable for infringement of at least claims 4 and 9 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

132. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `466 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `466 Patent and that the `466 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `466 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement,

Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `466 Patent.

DEMAND FOR JURY TRIAL

133. IV hereby demands a trial by jury on all claims and issues so triable.

PRAYER FOR RELIEF

WHEREFORE, IV respectfully requests judgment for itself and against Defendants as follows:

a. that this Court adjudge that the Defendants have infringed each of the Patents-in-Suit;

b. that this Court adjudge that the Defendants have willfully infringed each of the Patents-in-Suit;

c. that this Court ascertain and award IV damages under 35 U.S.C. § 284 sufficient to compensate for Defendants' infringement, including but not limited to infringement occurring before the filing of this lawsuit;

d. that this Court ascertain and award IV any post-judgment ongoing royalties under 35 U.S.C. § 284 as may be appropriate;

e. that this Court award any applicable pre-judgment and post-judgment interest;

f. that this Court award IV such other relief at law or in equity as the Court deems just and proper.

DATED: September 21, 2017

Respectfully submitted,

By: /s/ Martin J. Black by permission Claire Henry
Martin J. Black
LEAD ATTORNEY
Pennsylvania Bar No. 54319
Kevin M. Flannery (admission *pro hac vice* pending)
Pennsylvania Bar No. 62593
DECHERT LLP
Cira Centre
2929 Arch Street
Philadelphia, PA 19104
Tel: (215) 994-4000
Fax: (215) 994-2222
martin.black@dechert.com
kevin.flannery@dechert.com

Justin F. Boyce (admission *pro hac vice* pending)
California Bar No. 181488
DECHERT LLP
2440 W. El Camino Real, Suite 700
Mountain View, CA 94040-1499
Tel: (650) 813-4800
Fax: (650) 813-4848
justin.boyce@dechert.com

T. John Ward Jr.
Texas Bar No. 00794818
Claire Abernathy Henry
Texas Bar No. 24053063
WARD, SMITH & HILL, PLLC
1507 Bill Owens Pkwy.
Longview, TX 75604
Tel: (903) 757-6400
Fax: (903) 757-2323
Email: jw@wsfirm.com
Email: claire@wsfirm.com

Counsel for Plaintiff Intellectual Ventures II LLC